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TO: NANCY SMITH

FROM: David Lang

DATE:

SUBJECT: Beverly Airport

PAGE(S): 18 (Including Cover Sheet)

Pat & Gerry Was the power plant ash from Salem and Fall River exempt from MCP regulation. I was told it was already "adequately regulated" by Solid Waste. Is there a similarity here with Vitale.

David

City of Beverly
Conservation Commission

June 19, 2000

Mayor William Scanlon
City of Beverly
City Hall
Cabot Street
Beverly, MA 01915

Re: Technical Review of the Phase II Studies in the Vicinity of the Vitale Property

Dear Mayor Scanlon:

We want to thank you for the opportunity to provide technical comments on the Vitale property and the two-upgradient properties, the General Aviation Services site and the Casco/Nike site. In general, our primary concern is that there may be arsenic and TCE plumes of contamination, which may be beneath the Vitale property and flowing toward Wenham Lake. These plumes may originate on or upstream of the Vitale site. However, because of the lack of deep monitoring points on the Vitale property or wells off-site between the Vitale property and Wenham Lake, there exists a great deal of uncertainty about these zones and therefore the future recreational use of the Vitale site. We believe additional investigation is warranted and have enclosed the following comments to provide our specific concerns.

If you have any questions please feel free to contact me.

Sincerely,

David J. Lang, LSP
Beverly Conservation Commission

cc: Stephen Ransom – Ransom Environmental
Gerry McCall – MADEP, Northeast Region
Patricia Donahue – MADEP, Northeast Region
Nancy Smith – EPA, Region I

COMMENTS ON THE PHASE II COMPREHENSIVE SITE ASSESSMENT
VITALE SITE

1. There are too few monitoring wells throughout the Site and most of the wells were installed to find gasoline leaks around the building. There are no deep wells, yet there is TCE upgradient on the General Aviation Services property at very high concentrations. Because waste TCE can have a density greater than water (Sp. Gravity=1.40), deep wells are necessary to verify its presence or absence in the deep aquifer.

2. The report states that empty barrels were dumped in the pit. The Consent Decree, signed by the City and written by the DEP, states that barrels were dumped in the pit. During the 1960s and early 1970s, if barrels were dumped it would seem that full barrels were more likely dumped than empty barrels. In past discussions with truck drivers at other disposal sites, empty barrels were less likely dumped because they had cash value. If barrels were dumped in the Vitale Pit, they likely contained solids or liquids. As a result of the uncertainty, at least several deep wells should have drilled to or into the bedrock to define the vertical extent of waste. The actual perimeter of the disposal pit should also be outlined on the Site Plan.

3. Gasoline constituents and metals are the primary targets of the Ransom studies and not industrial solvents, such as TCE, which would require deeper wells. There are no deep wells or bedrock wells to determine the fate of TCE in MW-208 of the General Aviation Services property on the Vitale site. That bedrock well had very high readings of TCE (19,000 ug/L – when the federal maximum contaminant level (MCL) is 5 ug/L), which suggests the possible presence of DNAPL. The plume that will develop could easily migrate onto the Vitale property. I have enclosed some EPA literature on evaluations of DNAPL (Attachment 1).

4. Table 1, shows most of the wells are shallow. Therefore, they are not capable of monitoring the full nature and extent of contamination as required under the Massachusetts Contingency Plan (MCP).

5. Upgradient shallow well MW-1 shows the shallow aquifer contains TCE. This well was destroyed. MW-1, should be replaced with a shallow and deep well to define the contamination coming onto the Vitale property.

6. Table 6, shows that surface water stations were not tested for VOCs (SW-201 to SW-203), yet upstream sample SW-1 contained very high concentrations of TCE at 240 ug/L and vinyl chloride at 120 ug/L. Not

sampling these stations for volatile organics when these compounds were recently found upstream we believe is an oversight.

7. Arsenic in surface water (Table 6) has a detection limit of 50 ppb, but the new proposed EPA Standard may be as low as 5 to 15 ppb. More sensitive testing may be necessary.

8. Table 8, has arsenic values in groundwater at 100 to 350 ug/L that should be evaluated further. The most downgradient well is MW-1VS, which has contained arsenic at 124 to 174 ppb, which is well above the drinking water standard. The EPA, has shown that inorganic arsenic exposure in humans by inhalation has been strongly associated with lung cancer (Attachment 2). It is clearly premature for Ransom to suggest site activities until the full risk associated with arsenic or TCE is determined. The EPA, is currently in the process of lowering the arsenic drinking water based on a recommendation from the National Academy of Science. The arsenic standard may be lowered to 10 to 15 ug/L.

9. It is unclear whether ash samples were collected and tested to determine whether they will leach arsenic, even though the fly ash deposit may be exempt from the MGL 21E regulations. These regulations do not exempt the owner/operator from human or environmental health risks, which result in ground water or surface water contamination from past co-disposal practices.

10. Hydraulic conductivity for the Site, which was not measured, was estimated to be 0.0328 feet per day. Based on this assumed hydraulic conductivity, Ransom estimated that the groundwater flow would be in the glacial till at .5 feet per year. This suggests that any contamination present in the area that was found 20 years ago would have moved less than 10 feet. This estimate is unsupported and not based on any field measurements. This methodology does not seem to meet the minimum requirements of the MCP to determine the groundwater flow rates. In addition, the report does not discuss the bedrock aquifer, which is just 5 or 10 feet below ground surface (BGS) on the upgradient west end of the property and certainly an important component of the Vitale site, as well as the upstream Casco/Nike and General Aviation sites.

11. Metals in soils that exceeded the DEP background, by at least 3 times, included arsenic, barium, berilium, selenium, strontium and vanadium. Do these metals pose a risk for inhalation?

12. Be, Se, Sr, Va were never tested in groundwater, except for one round in 1999. No MCP standards are presented in the table. Are additional tests planned for these metals?

13. TCE and cis 1,2 DCE were found in elevated concentrations sediment sample SD-10. What is the source? Why are no wells placed in the area to evaluate? Does this pose a dermal contact risk and are other samples planned for this area?

14. The lead MCP standard for GW-1 is 15 ug/L, yet the laboratories instrument detection limit is 50 ug/L. The MCP standard for GW-3 is 30 ug/L for lead. Because the instrument used is not as sensitive as the regulatory standards, this would seem to require more sensitive sampling techniques. Are the exceedences of GW-1 and GW-3 standards, found in Table 8, a concern considering the potential future uses of the Site and the proximity to the water supply?

18. Are there other viable PRPs paying for the clean up, such as Mass Electric or the past owners/operators? The MCP states that the cleanup responsibility is held by the present <u>and</u> past owners/operators.

19. As discussed earlier, the sample from SW-1, collected in the wetlands, contained 240 ug/L of TCE and 120 ug/L of vinyl chloride. This is an extremely high concentration for a surface water sample in the middle of the wetlands. Further downstream, at SD-10 a sediment sample collected on the Vitale property contained 180 ug/kg of TCE and 300 ug/kg of cis-1,2-DCE. This would appear to certainly trigger a Method 3 Ecological Risk Assessment, instead of only an assessment of potential human receptors. Is it Ransom's view that only a human health risk is necessary when surface water and sediments also appear impacted?

20. Asbestos shingles were dumped in the Vitale Pit, but I did not review any tests for asbestos.

21. The Consent Decree says, submit a Scope of Work, which would address dredging and disposal of fly ash into the wetlands and restoration of damaged wetlands.

COMMENTS ON THE INTERIM PHASE II COMPREHENSIVE SITE ASSESSMENT
GENERAL AVIATION SERVICES SITE

We offer these comments on the General Aviation (GA) site Interim Phase II Comprehensive Site Assessment, because we are concerned about the high concentrations of contaminants found at the GA Site, which may be migrating under the Vitale property toward Wenham Lake.

1. In 1987, IEP sampled well OW-2 at the rear of the GA hanger. This shallow well contained trichloroethylene (TCE) at 1500 ug/L and 1,2-DCE at 720 ug/L. Ransom, during reconnaissance in 1995 and 1996, could not find monitoring well OW-2. In December of 1997, Ransom installed wells MW-102, MW-207 and MW-208 in the vicinity of OW-2. Does Ransom know that these wells were installed near OW-2? If it was simply scaled from a map, such an approximation could be off by 25 to 50 feet. Therefore, the locations may not be near enough to OW-2 to find the source of contamination.

2. The MCP requires a thorough site history. This site history is vague, therefore, it may not be consistent with the minimum requirements of the MCP. Did ComDell use TCE? Did the Vitale Company use TCE? Did Ransom ask any member of the Vitale Company about TCE usage? Did Revere Aviation use TCE? Were they contacted by Ransom to discuss the site history?

3. Wells MW-205 and MW-206 are apparently drilled very close to one another. In addition, they are closely screened to approximately 3 to 10 feet BGS. This type of data collection seems duplicative. There are no other shallow or deep wells downgradient from the spot of contamination that were detected in MW-102 and the original well OW-2.

4. Another major concern, is that nearly all of the wells are drilled quite shallow (9.5 to 21 feet, Table 1). The deepest well is MW-208. This well was drilled to 41 feet with the concentration of TCE being 19,000 ug/L. Since, TCE often likes to sink when dumped or disposed as a pure product, the majority of these wells maybe much too shallow to determine whether there is any significant concentration even lower in the bedrock aquifer. This is supported by the fact that some of the well logs describe the bedrock as being moderately fractured. It certainly appears that the TCE concentration at MW-208 exceeds the DNAPL criteria of one percent and that much more work is necessary to determine the extent of contamination. In addition, if DNAPL is present and in the rock fissures, then it certainly suggests that additional deep wells are necessary to

determine the overall extent of the potential DNAPL contamination. I have enclosed some information on DNAPL to help you understand the issue (Attachment 1). The data also suggests that deep wells are necessary in the Vitale Pit and downstream toward Wenham Lake to follow the trends of this potentially deep TCE plume.

5. On Page 6 of the report, there is a description of an area at the rear of the building where the drum storage area was located, as well as an area of oil stained soil. This should be shown on a map. It is not clear whether this area was tested or sampled and whether a monitoring well was placed there. Is this same area located in the vicinity of SS-218, SS-220A and SS-221A, which is shown on the Site Plan? These soil samples contained elevated concentrations of TCE, as shown in Table 4. For instance, SS-221A, contained 1400 ug/kg of TCE. This would appear to be a second major source area of solvents, since it is approximately 200 feet south of MW-208, the "hot well" that was described earlier. This is also adjacent to SS-2, which appears to contain 3700 ug/kg of TCE. These high readings of TCE in surface soils are quite unusual because of the volatility that this compound has. Since, TCE is generally not found in surface soils exposed to volatilization at these concentrations, unless there has been a significant release or a recent release, why was no well placed there?

6. At SS-221, there were also significant hits of arsenic at 120 ppm, as well as lead at 120 ppm. SS-2B, contained 136 ppm of arsenic. What is the source of lead and arsenic found at the ComDell/Gurnard building? What historical site users generated metal wastes? Could this be the source of the arsenic plume found on the Vitale property located at MW-V1S, MW-V2S and MW-V2D, or the elevated lead found in MW-2S and MW-V2S?

7. Because Ransom found extremely high levels of TCE, indicative of DNAPL in the bedrock, are you planning to rescore this Site as stated in MCP regulation 40.0530? The regulation states that any person performing response actions at a disposal sight shall rescore such disposal sight, using the numerical ranking system, if he or she obtains new or additional data, which is likely to result in a score causing reclassification of a disposal site from Tier II to Tier I. This would seem to be a prudent thing to do, particularly because of the known "hot spot", surface water contamination verified at SW-1 and sediment contamination verified at SD-10. These elevated TCE hits are in the tributary, which flows to Wenham Lake and provides the drinking water for nearly 100,000 people. As you know, once TCE gets into the bedrock fissures, it could ultimately discharge to the Lake.

8. Has Ransom done any further analysis of the site history from ComDell, Revere Aviation or Gurnard Manufacturing? Are these facilities still viable entities operating in the Commonwealth? If so, has it been recommended that the City pursue the cost recovery efforts on those companies, since it would appear that they all may have used the solvents that are currently found in groundwater and may ultimately have to be remediated?

9. One unsupported conclusion drawn by Ransom, was that the hydraulic conductivity for the Site that was not measured was estimated to be 0.0328 feet per day. Based on their assumed hydraulic conductivity, they estimate that the groundwater flow would be in the glacial till to be 0.5 feet per year. This suggests that any contamination present in the area that was found 20 years ago would have moved less than 10 feet. This estimate has virtually no basis and would appear to be self-serving if the contamination is not moving. The source of TCE at MW-1 on the Vitale site, must be on the Vitale site given these slow velocities.

10. The hydrogeologic discussion would not seem to meet the minimum requirements of the MCP, which requires you to determine the groundwater flow rates; permeability; bedrock depth and contours; as well as existing and potential migration pathways; whether there is exposure potential from non-aqueous phase liquids. In addition, it does not discuss the bedrock, which is literally 5 or 10 feet BGS and certainly a major focal point on the GA site given that TCE was found in the bedrock.

11. The sample from SW-1, collected in the adjacent wetlands, contained 240 ug/L of TCE and 120 ug/L of vinyl chloride. This is an extremely high concentration for a surface water sample in the middle of the wetlands. This would appear to certainly trigger a Method 3 Ecological Risk Assessment, instead of only an assessment of potential human receptors as recommended by Ransom.

INTERIM PHASE II COMPREHENSIVE SITE ASSESSMENT
CASCO CHEMICALS/NIKE MISSILE SITE

We offer these comments on the Casco Chemicals/Nike Missile site Interim Phase II Comprehensive Site Assessment. We would like to thank you for the opportunity to review the Ransom studies that are taking place in the water shed upgradient of the Vitale site.

1. The first major concern of the investigation by Ransom, is that none of the wells drilled were extended deeper than 21 feet and extended only into the top 5 to 6 feet of groundwater. Because of high levels of contamination that was found upgradient in the bedrock at the former ComDell facility at a depth of 40 feet below ground surface, a Phase II investigation would not be complete unless deep bedrock wells are drilled.

2. Another major defect in the investigation, is the fact that only three wells were drilled near the Nike facility. Nike facilities across the United States have had a long history of solvent use and abuse. One of the wells, MW-202, which was apparently installed in 1999 in the vicinity of the Nike base, does not appear to have been tested for chlorinated solvents, such as TCE. It was only tested for arsenic, barium, chromium, lead and silver. Such an oversight is certainly inconsistent with the MCP, which requires one to investigate the nature and extent of contamination consistent with previous site uses. Because solvents were likely used at the Nike facility, it is unclear why a well would be installed and not tested for these solvents.

3. The MCP requires that a disposal history of the Site be included in the Phase I and updated in the Phase II. It is not apparent from the description of the site history whether the author believes that TCE was used at the Nike dump area or at the Nike facility. Because other Nike facilities used TCE for cleaning, it is likely that they used TCE here. Many of these military facilities across the U.S. have solvent disposal problems. There are no wells in the vicinity of the former Nike dump. Only one very shallow well is found several hundred feet downgradient and this well would not be expected to detect TCE. To what effort did Ransom investigate to determine whether TCE was used at the Nike facility? In Ransom's experience have they found that this type of facility would have used solvents? From the conclusions drawn from Ransom, a Method 3 Risk Assessment is proposed for the Site. Would not an Environmental Risk Assessment also be required because of the high levels of TCE and vinyl chloride that were found in surface water sample SW-1? What is the source of high TCE, 240 ug/L, found in SW-1?

4. The MCP requires that the investigator determine the nature and extent of the contamination and its environmental fate. Table 8, shows the results of the test pits that were done at the Nike facility in the former dump. Although, solvents may have likely been used, no volatile organic tests for TCE were conducted on the materials in test pits 1, 2, 3, 4 and 6. No data is presented for test pit 5, nor is it located on the map. This appears to be another reason to believe that the Phase II Investigation is incomplete.

5. Another requirement of the MCP is to determine the groundwater potentiometric surface, the vertical gradients and the flow rates. There is no information provided to determine the gradients at the Site because there are no deep wells on the Casco/Nike site. Because this Site is in the upper reaches of the water shed, it would appear that Airport Brook's gradients would be downward from the former Nike dump, which did contain solvents and migrated to groundwater. It would be apparent that monitoring well MW-105, which is screened from 6 feet to 12 feet BGS, would never see the contamination because it would migrate downward and be beneath the zone where the well is currently screened. Deeper wells are needed in the vicinity to determine what the flow gradients are, as well as determine groundwater quality in the deeper aquifer.

6. On Page 8, of the Casco Report, it's listed that in 1982 the MADEP detected concentrations of chlorinated organic compounds collected from the wetland north of the septic leach field and in Airport Brook located just north of the former Nike dump site. Because these chlorinated solvents were found so close to the former Nike dump site, wouldn't it seem appropriate to test the soil samples in the vicinity of the Nike dump site for chlorinated solvents, as well as install a monitoring well in the area of the test pits to test for volatile organic compounds?

7. When did Ransom observe the numerous mounds that are described on Page 9 in the Nike dumpsite? What type of material was found in these test pits and are there geologic logs that were developed from the test pit activities? We note that the general boring logs and monitoring logs for wells are found in Appendix F, but we did not find any reference to what type of soil or debris material was found in the test pits. Were photographs taken? Were these test pits conducted after the Weston Geophysical Report? Were these materials tested for volatile organics, because of the strong likelihood of TCE usage?

8. In Appendix G, there are results of the Geophysical Survey conducted by Weston, which describe the location of interpreted buried metal objects in the army dumpsite. The text on Page 19 states that very little metal debris was found and no tanks or drums were observed, as well as no evidence of a release of oil or hazardous materials was observed during excavation of the test pits. What was the mounded material found? It seems unusual that if there wasn't a release of oil or hazardous materials observed, then why was the sample analyzed for RCRA metals, as well as EPH, but not volatile organics? What were the burned metal objects found by Weston?

9. The most remarkable conclusion drawn by Ransom, was that the hydraulic conductivity for the Site was not measured, yet estimated to be 0.0328 feet per day. Based on their assumed hydraulic conductivity, Ransom estimate that the groundwater flow would be in the glacial till 0.5 feet per year. This suggests that any contamination present in the area that was found 20 years ago would have moved less than 10 feet. Because of the slow velocity, it would not seem to meet the minimum requirements of the MCP to determine the groundwater flow rates. In addition, the report does not even discuss the bedrock, which is literally 5 or 10 feet BGS and certainly an important factor in the Casco Chemical site, as well as the Nike site.

ATTACHMENT 1

PB94-195039

EPA/600/R-94/120
August 1994

EVALUATION OF TECHNOLOGIES FOR IN-SITU CLEANUP OF DNAPL CONTAMINATED SITES

by

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Even if there is no rainwater infiltration through the residually contaminated zone, considerable contamination of the aquifer may still develop [Hinchee and Reisinger, 1987; Schwille, 1988]. Vapor transport of volatile organic compounds, VOCs, acts independently of the leaching mechanism. The stippled areas within the unsaturated and saturated zones in Figure 2.5.1 indicate the regions affected by hydrocarbons emanating from the soil zone contaminated by residual DNAPL.

Denser-than-air vapors emanating from the contaminated soil zone have been observed to migrate downward to spread along the water table [Marrin and Thompson, 1987; Schwille, 1988], and this has been the subject of several recent studies [Hunt et al., 1988a; Falta et al., 1989; Sleep and Sykes, 1989; McClellan and Gillham, 1990; Mendoza and Frind, 1990a,b; Gierke et al., 1990, 1992]. At the water table, vapors equilibrate with the aqueous phase according to Henry's law, and a dissolved plume develops. The lateral spreading and diffusion of vapors at the water table can be significant as vapors may migrate below buildings, parking lots, and other structures [Hinchee and Reisinger, 1987]. Ground-water contamination occurring upgradient of the DNAPL source also has been observed as a result of vapor transport in the vadose zone [Marrin and Thompson, 1987].

2.5.2 Saturated Zone Transport

Figure 2.5.2 shows a conceptual view of a release of a sufficient quantity of DNAPL to overcome the capillary forces and the retention capacities of the vadose zone, capillary fringe and saturated zone. As before, the cross-hatched area in Figure 2.5.2 shows the soil regions which are contaminated by the residual DNAPL. While the vapor transport within the vadose zone is almost identical between Figures 2.5.1 and 2.5.2, the dissolved plume within the saturated zone is noticeably larger because the residual DNAPL and DNAPL pools (layers or lenses) are in direct contact with ground water.

Figure 2.5.2 also shows DNAPL pools which can form in the depressions of low permeability strata such as silty or clayey lenses, aquitards, and bedrock. DNAPL pools can form when mobile DNAPL encounters water-wet strata with very small pore throats that result in prohibitively large DNAPL entry pressures. DNAPL accumulation up to saturations of 70-80% of the pore space may occur at the strata interface. Because pooled DNAPL occurs in excess of its residual saturation, it should be considered mobile because it may penetrate into preexisting fissures in the underlying clayey strata [Kueper and McWhorter, 1991]. Preexisting fissures in naturally occurring clays are known to exist at substantial depths below the water table [D'Astous et al., 1989; Sabourin, 1989]. DNAPL pools may also drain through newly created fissures in a clayey strata resulting from clay desiccation, as already mentioned. Upgradient DNAPL migration along horizontal strata is possible also, as shown in Figure 2.5.2. Migration is obviously enhanced when the underlying strata is inclined.

DNAPL will also penetrate into bedrock fractures as shown in Figure 2.5.3, and the resulting downward vertical migration of DNAPL occurring within the fractures may be extensive owing to the low retention capacities of fractured bedrock systems. For example, based on laboratory experiments employing planar fractures with a frequency of 5 fractures/meter and 0.2 mm apertures, Schwille (1988) estimated DNAPL retention capacities on the order of 0.25 l hydrocarbon/m^3 for weakly fractured rock systems of moderate hydraulic conductivity. This value is an order of magnitude smaller than that for unsaturated and saturated soils. Hence, once the DNAPL enters a fractured bedrock system, it can contaminate a much larger region, given volumetric considerations.

While the influence of pronounced soil heterogeneities such as clay aquitards and bedrock on DNAPL migration can be dramatic, it is important to note that even subtle hydraulic conductivity changes *in clean sands, on the order of a factor of 2, may be sufficient to cause preferential flow of DNAPL [Kueper and Frind, 1991a]. Site heterogeneities on that order is quite common, thus complicating the NAPL flow and often making even the identification of residually contaminated soil zones and DNAPL pools difficult.*

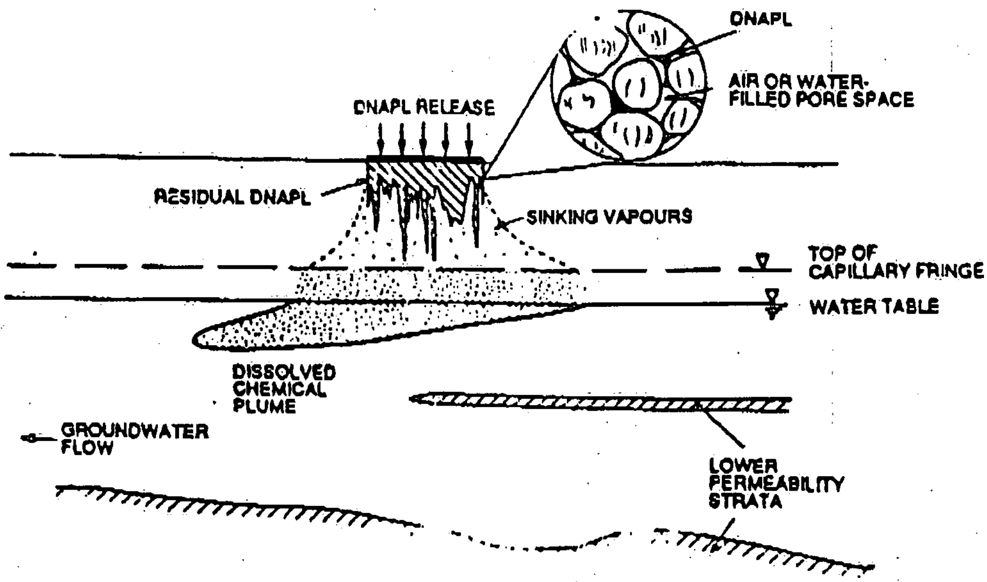

Figure 2.5.1 Schematic of the distribution of subsurface contamination emanating from residual DNAPL source in the vadose zone [Feenstra and Cherry, 1990].

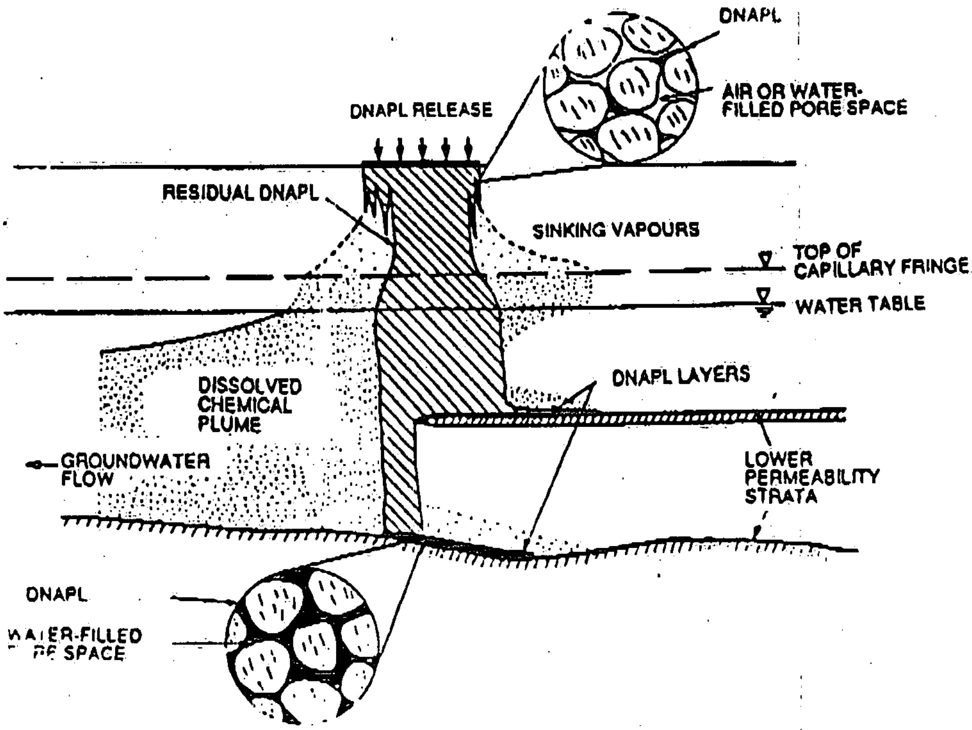

Figure 2.5.2 Schematic of the distribution of subsurface contamination emanating from residual DNAPL sources in the vadose and water saturated zones, and DNAPL pools [Feenstra and Cherry, 1990].

ATTACHMENT 2

EPA United States Environmental Protection Agency — Office of Air Quality Planning & Standards OAQPS

TTNWeb UATW Unified Air Toxics Website

ARSENIC AND COMPOUNDS[(1)]

107-02-8

Hazard Summary

- Acute (short-term) inhalation exposure to inorganic arsenic has resulted in gastrointestinal effects (nausea, diarrhea, abdominal pain), **hemolysis, and central and peripheral nervous system disorders. Arsine is extremely toxic to humans, with a half-hour exposure to 25 to 50 ppm reported to be lethal.**
- Chronic (long-term) inhalation exposure to inorganic arsenic in humans is associated with **irritation of the skin and mucous membranes** (dermatitis, conjunctivitis, pharyngitis, and rhinitis), while chronic oral exposure has resulted in **gastrointestinal effects, anemia, peripheral neuropathy, skin lesions, and liver or kidney damage.**
- The U.S. Environmental Protection Agency (EPA) has not established a Reference Concentration (RfC) for inorganic arsenic. The RfC for arsine is 0.00005 mg/m^3.[a] EPA estimates that inhalation of this concentration or less over a lifetime would not likely result in the occurrence of chronic noncancer effects.[b]
- The Reference Dose (RfD) for inorganic arsenic is 0.0003 mg/kg/d.[c] EPA estimates that consumption of this dose or less over a lifetime would not likely result in the occurrence of chronic noncancer effects. EPA has not established an RfD for arsine.
- Human data suggest a relationship between inhalation exposure to inorganic arsenic in humans and an increased risk of reproductive effects, such as spontaneous abortions. However, these data are not sufficient to suggest a cause and effect relationship, due to the chance that other chemicals and risk factors were involved. Oral animal studies have reported inorganic arsenic to be fetotoxic and to cause birth defects.
- Inorganic arsenic exposure in humans, by the inhalation route, has been shown to be strongly associated with lung cancer, while ingestion of inorganic arsenic in humans has been linked to a form of skin cancer and also to bladder, liver, and lung cancer. EPA has classified inorganic arsenic as a Group A, human carcinogen of high carcinogenic hazard, with a 1/ED10 value of 140 per (mg/kg)/dd and an inhalation unit risk estimate of 4.3 x 10-3(µg/m3)-1. EPA has not classified arsine for carcinogenicity.

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[a] Milligrams per cubic meter is the unit of measurement for chemicals in air.

[b] The RfC is not a direct estimator of risk but rather a reference point to gauge the potential effects. Exceedance of the RfC does not imply that an adverse health effect would necessarily occur. As the amount and frequency of exposures exceeding the RfC increase, the probability of adverse health effects

EPA United States Environmental Protection Agency
Office of Water

Office of Ground Water and Drinking Water

NRC/NAS Report on Arsenic in Drinking Water

What is the NRC/NAS Report on Arsenic in Drinking Water?

- The Office of Water of the U.S. Environmental Protection Agency (EPA) commissioned this report in 1996. EPA asked the National Research Council (NRC) of the National Academy of Sciences (NAS) to review the current state of the science for estimating risks associated with arsenic in drinking water.

- This report is based on a more complete database and research findings that have become available since the 1988 EPA risk assessment.

What does the report say?

- The report recommends lowering the current drinking water standard of 50 micrograms per liter (ug/L; equivalent to parts per billion (ppb)). (EPA initially set this standard in 1975 as an interim standard for arsenic; the Safe Drinking Water Act, as amended in 1986, converted it to a maximum contaminant level (MCL) in 1986.)

- This recommendation is based on NRC assessments of the risks of skin, lung, and bladder cancer from drinking water containing inorganic arsenic. The report also describes potential risks of cardiovascular effects.

What is EPA going to do?

- EPA expected the NRC to recommend lowering the MCL. The NRC report provides the update to the science needed to support revising the risk characterization to develop the health-based non-enforceable goal for drinking water, known as the maximum contaminant level goal (MCLG).

- Under the Safe Drinking Water Act as amended in 1996, EPA has to propose a new arsenic regulation by January 1, 2000 and finalize a new rule by January 1, 2001. In addition, EPA must review the new regulation by 2007, at the latest, and revise it, if appropriate, based on new data and information.

- EPA has been preparing to propose an arsenic regulation (new MCL, an MCLG and compliance treatment technologies) and will issue the proposed and final regulations on schedule. In addition to using the results of a revised risk characterization, the MCL takes into account factors such as the availability of appropriate analytical methods; the efficiency of treatment technologies for all sizes of public water systems; the cost of treatment options; and the health benefits achieved by different arsenic levels in drinking water.

- Also as required by the 1996 amendments, EPA submitted a research plan to Congress in 1997 that would provide data for the next appraisal of the arsenic standard.

- EPA will reexamine its criteria and existing policy for arsenic under the Clean Water Act. The current ambient water quality arsenic criterion is already much lower than the current drinking water MCL.

Who is at risk? Since the current MCL is at 50 ppb, is everyone exposed to 50 ppb?

- Arsenic levels are already below the 50 ppb level in all community water systems with surface water supplies and are infrequently exceeded by community water systems with ground water supplies.

- In a 1992 study, EPA estimated that only 1% of all public water systems would have arsenic levels greater than 20 ppb. The proposed rule will be based on a new national occurrence estimate using more current monitoring data.

The NRC/NAS Report is available online:

Full Report EXIT EPA

Return to Arsenic in Drinking Water page
